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L6: Entry 1 of 2

File: JPAB

May 8, 2002

PUB-NO: JP02002127227A

DOCUMENT-IDENTIFIER: JP 2002127227 A

TITLE: METHOD AND APPARATUS FOR MANUFACTURING STAPLE FIBER- CONTAINING RUBBER SHEET

PUBN-DATE: May 8, 2002

INVENTOR-INFORMATION:

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MITSUBOSHI BELTING LTD

APPL-NO: JP2000329842

APPL-DATE: October 30, 2000

INT-CL (IPC): B29 C 47/20; B29 C 47/24

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method and apparatus for manufacturing a staple fiber-containing rubber sheet, capable of applying stretching force and shearing force to a staple fiber- containing rubber in the circumferential direction thereof so as to gradually increase them toward a discharge port to extrude a cylindrical molded object wherein staple fibers are oriented in the circumferential direction and further easily forming the cylindrical molded object immediately after extrusion into a sheet.

SOLUTION: The inner die 9 connected to a mandrel 8 is formed into a conical shape gradually expanded in its diameter toward the discharge port 11 and this inner die 9 is housed in an outer die 10. The inner die 10 is rotated centering around its axis to apply stretching force and shearing force to the staple fiber-containing rubber so as to gradually increase the same toward the discharge port in the circumferential direction thereof to extrude and mold the cylindrical molded object wherein the staple fibers are oriented in the circumferential direction. A linear slit part 51 is axially formed in the surface layer of the extruded cylindrical molded object 13 and tension is further applied to the slitted cylindrical molded object in the circumferential direction thereof to expand the slitted cylindrical molded object and the cylindrical molded object is cut along the linear slit part 51 by a cutting means 40 to be formed into a sheet.

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L6: Entry 2 of 2

File: DWPI

May 8, 2002

DERWENT-ACC-NO: 2002-735803

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TITLE: Rubber sheet manufacturing method involves rotating inner die with mandrel to apply shear force on rubber to orient fibers in peripheral direction, and applying tensile force to rubber by supplying gas

PATENT-ASSIGNEE:

ASSIGNEE

CODE

MITSUBOSHI BELTING LTD

MIUA

PRIORITY-DATA: 2000JP-0329842 (October 30, 2000)

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PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
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APPLICATION-DATA:

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JP2002127227A	October 30, 2000	2000JP-0329842	

INT-CL (IPC): [B29 C 47/20](#); [B29 C 47/24](#); [B29 K 21:00](#); [B29 K 105:12](#); [B29 L 7:00](#)

ABSTRACTED-PUB-NO: JP2002127227A

BASIC-ABSTRACT:

NOVELTY - A conical die (15) has an outer die (10) and rotatable inner die (9). A screw-type extruder (3) extrudes the short fiber mixed rubber into the space between the two dies. The inner die rotates with a mandrel (8), such that rubber mix expands towards the periphery gradually with fibers oriented in peripheral direction. A tensile force is applied to the rubber casting by spraying a gas and the rubber sheet is cut axially by cutters.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for rubber sheet manufacturing apparatus.

USE - For manufacturing rubber sheet containing short fibers.

ADVANTAGE - By applying a shear force on the rubber by rotating inner die, the fibers are oriented in the direction of periphery and the orientation is controlled by adjusting the circumferential speed of inside die. The sheet is easily finished

by cutting axially by the cutters on a linear cutting line, by applying a tensile force on the inner surface by supplying compressed gas.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic view of the rubber sheet manufacturing apparatus.

Extruder 3

Mandrel 8

Dies 9,10,15

Cutters 40,50

CHOSEN-DRAWING: Dwg.1/8

TITLE-TERMS: RUBBER SHEET MANUFACTURE METHOD ROTATING INNER DIE MANDREL APPLY SHEAR FORCE RUBBER ORIENT FIBRE PERIPHERAL DIRECTION APPLY TENSILE FORCE RUBBER SUPPLY GAS

DERWENT-CLASS: A32

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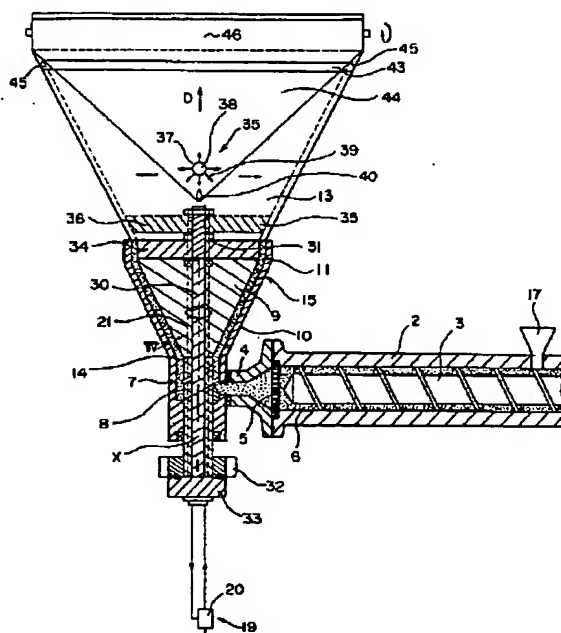
KL80 KL88 KW23

(54) 【発明の名称】 短繊維入りゴムシートの製造方法及びその製造装置

(57) 【要約】

【課題】 短繊維を含むゴムに吐出口に向かって徐々に大きくなる円周方向への引き伸ばしとせん断力を与えることで、短繊維を円周方向に配向させた円筒状成形体を押し出し、更に押し出された直後の円筒状成形体を容易にシート化できる短繊維入りゴムシートの製造方法及びその製造装置を提供する。

【解決手段】 マンドレル8に連結した内ダイ9を吐出口11に向かって径を徐々に拡張させた円錐形としてこれを外ダイ10に収容し、かつ内ダイ10をその軸心中心に回転させながら、短繊維を含むゴムに吐出口に向かって徐々に大きくなる円周方向への引き伸ばしとせん断力を付与して、短繊維を円周方向に配向させた円筒状成形体13を押し出成形し、押し出された円筒状成形体13の表面層に軸方向へ直線状の切込み部51を入れ、切込みを入れた円筒状成形体をさらに径を拡張させながら円周方向へ張力を与え、そして上記円筒状成形体を直線状の切込み部51で切断手段40によって切開しながらシートにする。



【特許請求の範囲】

【請求項1】 短繊維を混入したゴムをシリンダーの押出スクリューで混練りした後、マンドレルの先端に接続したダイから押出し、得られた短繊維入り筒状のゴム形体からシートに仕上げる短繊維入りゴムシートの製造方法において、

マンドレルに連結した内ダイを吐出口に向って径を徐々に拡張させた円錐形としてこれを外ダイに収容し、かつ内ダイをその軸心中心に回転させながら、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を付与して、短繊維を円周方向に配向させた円筒状成形体を押出成形し、

押出された円筒状成形体の表面層に軸方向に直線状の切込み部を入れ、

切込みを入れた円筒状成形体をさらに径を拡張させながら円周方向へ張力を与え、

上記円筒状成形体を直線状の切込み部で切開しながらシートにする、ことを特徴とする短繊維入りゴムシートの製造方法。

【請求項2】 押出された直後の円筒状成形体をさらに円錐形状の補助ガイドで径を拡張させ、円周方向へ張力を与える請求項1記載の短繊維入りゴムシートの製造方法。

【請求項3】 カッターを円錐形状の補助ガイドを支持台にして円筒状成形体の表面へ押圧することで、軸方向へ直線状の切込み部を設ける請求項2記載の短繊維入りゴムシートの製造方法。

【請求項4】 円筒状成形体を切開するとき、圧縮気体を円筒状成形体内部に吹き付けながら円周方向へ張力を与える請求項1または2記載の短繊維入りゴムシートの製造方法。

【請求項5】 ガイド部材を切開したシートの両端部に当接する請求項1～4のいずれかに記載の短繊維入りゴムシートの製造方法。

【請求項6】 円筒状成形体を重力に抗する方向に押出すようにした請求項1～5のいずれかに記載の短繊維入りゴムシートの製造方法。

【請求項7】 内ダイの内部を冷却しながら軸心を中心に回転させる請求項1～6のいずれかに記載の短繊維入りゴムシートの製造方法。

【請求項8】 短繊維を混入したゴムをシリンダーの押出スクリューで混練りした後、マンドレルの先端に接続したダイから押出し、得られた短繊維入り筒状のゴム形体からシートに仕上げる短繊維入りゴムシートの製造装置において、

押出スクリューの回転により短繊維を含むゴムを混練するシリンダーと、

短繊維混入ゴムをマンドレルの回転によって移動させる押出部と、

マンドレルに連結した内ダイを外ダイに収容し、内ダイ

の径を吐出口に向って徐々に拡張させるとともに、内ダイをその軸心中心に回転可能にし、円周方向への引き伸ばしとせん断力を付与して短繊維を円周方向に配向させた円筒状成形体に押出するダイ部と、

押出された直後の円筒状成形体の表面層に軸方向に直線状の切込み部を設ける切込み手段と、

切込みを入れた円筒状成形体にさらに円周方向へ張力を与える拡張手段と、

円筒状成形体を上記直線状の切込み部分で切開する切開手段と、を備えたことを特徴とする短繊維入りゴムシートの製造装置。

【請求項9】 拡張手段が、押出された直後の円筒状成形体をさらに径を拡張させ円周方向へ張力を与える円錐形状の補助ガイドである請求項8記載の短繊維入りゴムシートの製造装置。

【請求項10】 切込み手段が円筒状成形体を表面から押圧して軸方向へ直線状の切込み部を設けるカッターであり、該カッターの支持台が円錐形状の補助ガイドである請求項9記載の短繊維入りゴムシートの製造装置。

【請求項11】 拡張手段が、押出された直後の円筒状成形体内部に圧縮気体を吹き付けながら円周方向へ張力を与える気体吹き付け装置である請求項8または9記載の短繊維入りゴムシートの製造装置。

【請求項12】 ガイド部材が切開したシートの両端部に当接するように配置されている請求項8～11のいずれかに記載の短繊維入りゴムシートの製造装置。

【請求項13】 軸心を中心に回転する内ダイは、内部を冷却する装置を備えている請求項8～12のいずれかに記載の短繊維入りゴムシートの製造装置。

【請求項14】 内ダイの径が吐出口に向って徐々に拡張するテーパ角度 θ は、 $30^\circ \leq \theta < 90^\circ$ であり、内ダイの最小径Aと最大径Bの比率である拡張比 B/A が1.5～12.5である請求項8～13のいずれかに記載の短繊維入りゴムシートの製造装置。

【請求項15】 内ダイと外ダイの流路幅は、内ダイがマンドレルに連結した根元部から吐出口まで均一である請求項8～14のいずれかに記載の短繊維入りゴムシートの製造装置。

【請求項16】 円筒状成形体を重力に抗する方向に押出すようにダイ部を配置した請求項8～15のいずれかに記載の短繊維入りゴムシートの製造装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は短繊維入りゴムシートの製造方法及びその製造装置に係り、詳しくはマンドレルに連結した内ダイを吐出口に向って径を拡張させて円錐形とし、この内ダイを回転させることによって、短繊維混入ゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を同時に与えることで、短繊維を円周方向に配向させた円筒状成形体を押出し、更

に押出された直後の円筒状成形体を確実に切開してシートに仕上げる短繊維入りゴムシートの製造方法及びその製造装置に関する。

【0002】

【従来の技術】従来、未加硫ゴム中に短繊維を一定方向へ配向させる方法としては、図8(a)に示す圧延シート作製工程のように、回転速度を変えた一対のカレンダーロールに短繊維入り未加硫ゴムを投入し、圧延されたゴムシート中の短繊維をシートの圧延方向に配向させ、そして成形するベルト幅に応じて切断していた。その後、図8(b)に示す積層工程のようにカットした圧延シートを数枚重ね合わせて所定厚みに積層し、続いて図8(c)に示す巻付け工程のように短繊維が幅方向に配向した積層物を成形ドラムに巻き付けて伝動ベルトの作製に使用していた。

【0003】即ち、VリブドベルトやローエッジVベルトの伝動ベルトの製造方法では、円筒状の成型ドラムの周面に1〜複数枚のカバー帆布と接着ゴム層とを巻き付けた後、この上にコードからなる心線を螺旋状にスピニングし、更に圧縮ゴム層を順次巻き付けて積層体を得た後、これを加硫してベルトスリーブにしていた。ここで使用する圧縮ゴム層は、上記の図8(b)に示すように3〜4枚重ね合わせた厚みのもので、シート幅方向に短繊維が配向したものを成型ドラムに巻き付けていた。

【0004】しかし、圧延シートは、厚みを薄くしなければ、短繊維をシート圧延方向に十分に配向させることができないために、やむを得ずシートを重ねていたためにベルト成形用シートを得るには多大の工数を要していた。

【0005】これを改善する方法として、特公平6-9847号公報には、拡張ダイを取付けた押出機を用い、短繊維を押出円筒体の円周方向に配向させるもので、中間空間に、入口空間の所定の流路幅から出口空間の所定の流路幅まで流路幅が変化する拡大空間部を設け、拡張ダイの出口空間の断面積を入口空間の断面積より所定量大きく形成し、さらに入口部分の流路幅が中間部分の流路幅よりも狭く、出口部分の流路幅が中間部分の流路幅以下に設定したものが、提案された。

【0006】そして、特開平6-106602号公報には、押出した短繊維を円周方向に配向させた円筒状エラストマーを軸方向に切開する切断装置と、切開されたエラストマーを平板状に展開する展開装置を設け、更に押出装置と切断装置との間に案内装置を設けて、ここから空気を吹出すようにして、円筒状エラストマーの円周方向への収縮を抑えながら冷却し、不均一な収縮に起因する短繊維を配向の乱れを阻止し、またシートの両端と中央との距離が等しくなるように展開機構の傾きを調節できるようにしてフレアの発生を阻止した製造装置が開示されている。

【0007】

【発明が解決しようとする課題】しかしながら、従来の拡張ダイを使用する方法では、入口空間／中間空間、中間空間／出口空間の流路幅比率、入口部分／出口部分の半径、断面積の制御により3次的に配向率の調整を行うものであるが、ダイ形状に起因する流れの力で配向率を制御しているため、ダイを交換しなければ配向率を変えることができなかった。

【0008】また、押出装置と切断装置との間に設けた案内装置で空気を吹出して、円筒状エラストマーを冷却して円周方向への収縮を抑えながら、不均一な収縮に起因する短繊維を配向の乱れを阻止する製造装置では、押出された円筒状エラストマーを空冷した後に刃物で軸方向へ切断するところから、刃物にかなりの負担がかかり、特に厚みの大きい円筒状エラストマーを長時間にわたって切開するときには、刃物の交換は必須であった。

【0009】本発明はかかる問題に着目し、鋭意研究した結果、成形体の厚みに関係なく、マンドレルに連結した内ダイを吐出口に向って径を徐々に拡張させて円錐形とし、そして内ダイをその軸心中心に回転させることによって、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を与えることで、短繊維を円周方向に配向させた円筒状成形体を押出し、更に押出された直後の円筒状成形体を容易にシート化できる短繊維入りゴムシートの製造方法及びその製造装置を提供することを目的とする。

【0010】

【課題を解決するための手段】上記した目的を達成すべく本願請求項1記載の発明は、短繊維を混入したゴムをシリンダーの押出スクリューで混練りした後、マンドレルの先端に接続したダイから押出し、得られた短繊維入り筒状のゴム形体からシートに仕上げる短繊維入りゴムシートの製造方法において、(1)マンドレルに連結した内ダイを吐出口に向って径を徐々に拡張させた円錐形としてこれを外ダイに収容し、かつ内ダイをその軸心中心に回転させながら、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を同時に付与して、短繊維を円周方向に配向させた円筒状成形体を押出成形し、(2)押出された円筒状成形体の表面層に軸方向に直線状の切込み部を入れ、(3)切込みを入れた円筒状成形体をさらに径を拡張させながら円周方向へ張力を与え、(4)上記円筒状成形体を直線状の切込み部で切開しながらシートにする、短繊維入りゴムシートの製造方法にある。

【0011】この製造方法では、外ダイに収容した円錐形の内ダイをその軸心中心に回転させることにより、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を同時に付与することができることから、短繊維を円周方向に配向させた円筒状成形体を得ることができる。しかも、内ダイの周速度を調節することによって、厚みの大きい円筒状成形体でも

短繊維を円周方向に配向させることができ、また内ダイの周速度を変量することで、短繊維の円周方向への配向率を制御できるのでダイの交換が不要になる。また、押出された円筒状成形体の表面層に予め軸方向へ直線状の切込み部を入れた後、円筒状成形体に円周方向へ張力を与えつつ、該切込み部で切開しながら容易にシートに仕上げることが可能になる。

【0012】本願請求項2記載の発明は、押出された直後の円筒状成形体をさらに円錐形状の補助ガイドで径を拡張させ、円周方向へ張力を与える短繊維入りゴムシートの製造方法であり、切開によるシート化が容易になる。

【0013】本願請求項3記載の発明は、カッターを円錐形状の補助ガイドを支持台にして円筒状成形体の表面へ押圧することで、軸方向へ直線状の切込み部を設ける短繊維入りゴムシートの製造方法であり、予め円筒状成形体の円周方向に配向した短繊維を部分的に切断し、その後の切開によるシート化が容易になる。

【0014】本願請求項4記載の発明は、円筒状成形体を切開するとき、圧縮気体を円筒状成形体内部に吹き付けながら円周方向へ張力を与える製造方法であり、切開すると容易にシート化することができる。

【0015】本願請求項5記載の発明は、ガイド部材を切開したシートの両端部に当接する製造方法であり、切開したシートの端部が重なることなく容易にシート化することができる。

【0016】本願請求項6記載の発明は、円筒状成形体を重力に抗する方向に押出すようにした製造方法であり、円筒状成形体が重力により変形せず、寸法変化の少ない状態で押出が可能になる。

【0017】本願請求項7記載の発明は、内ダイの内部を冷却しながら軸心を中心に回転させる製造方法であり、内ダイの内部を冷却することで、内ダイの周速を高めても内部発熱によるゴムのスコーチを阻止し、その結果厚みの大きい円筒状成形体でも短繊維を円周方向に配向させることができる。

【0018】本願請求項8記載の発明は、短繊維を含むゴムをシリンダーの押出スクリューで混練りした後、マンドレルの先端に接続したダイから押出し、得られた短繊維入り筒状のゴム形体からシートに仕上げる短繊維入りゴムシートの製造装置において、押出スクリューの回転により短繊維を含むゴムを混練するシリンダーと、短繊維混入ゴムをマンドレルの回転によって移動させる押出部と、マンドレルに連結した内ダイを外ダイに収容し、内ダイの径を吐出口に向って徐々に拡張させるとともに、内ダイをその軸心中心に回転可能にし、円周方向への引き伸ばしとせん断力を付与して短繊維を円周方向に配向させた円筒状成形体に押出するダイ部と、押出された直後の円筒状成形体の表面層に軸方向へ直線状の切込み部を設ける切込み手段と、切込みを入れた円筒状成

形体にさらに円周方向へ張力を与える拡張手段と、円筒状成形体を上記直線状の切込み部分で切開する切断手段と、を備えた短繊維入りゴムシートの製造装置にある。

【0019】請求項1記載と同様に吐出口に向って徐々に大きくなる円周方向に引き伸ばしと回転方向のせん断力を同時に短繊維混入ゴムに与えるため、短繊維を円周方向に配向させた円筒状成形体を得ることができる。しかも、内ダイの周速度を調整することによって、厚みの大きい円筒状成形体でも短繊維を円周方向に配向させることができ、また内ダイの周速度を変量することで、短繊維の円周方向への配向率を制御できてダイの交換が不要になる。また、押出された円筒状成形体の表面層に予め軸方向へ直線状の切込み部を入れた後、円筒状成形体に円周方向へ張力を与えつつ、該切込み部で切開するために容易にシートに仕上げることが可能になる。

【0020】本願請求項9記載の発明は、拡張手段が、押出された直後の円筒状成形体をさらに径を拡張させ円周方向へ張力を与える円錐形状の補助ガイドである短繊維入りゴムシートの製造装置であり、円筒状成形体には円周方向に張力がかかっているために、切開によるシート化が容易になる。

【0021】本願請求項10記載の発明は、切込み手段が円筒状成形体を表面から押圧して軸方向へ直線状の切込み部を設けるカッターであり、該カッターの支持台が円錐形状の補助ガイドである短繊維入りゴムシートの製造装置であり、予め円筒状成形体の円周方向に配向した短繊維を部分的に切断し、その後の切開によるシート化が容易になる。

【0022】本願請求項11記載の発明は、拡張手段が押出された直後の円筒状成形体内部に圧縮気体を吹き付けながら円周方向へ張力を与える気体吹き付け装置である短繊維入りゴムシートの製造装置であり、請求項9と同様に円筒状成形体には円周方向に張力がかかっているために、切開によるシート化が容易になる。

【0023】本願請求項12記載の発明は、ガイド部材が切開したシートの両端部に当接するように配置されている短繊維入りゴムシートの製造装置であり、切開したシートの端部が重なることなく完全にシート化することができる。

【0024】本願請求項13記載の発明は、軸心を中心に回転する内ダイは、内部を冷却する装置を備えている短繊維入りゴムシートの製造装置であり、内ダイを冷却することで、内ダイの周速を高めることができ、その結果厚みの大きい円筒状成形体でも短繊維を円周方向に配向させることができる。

【0025】本願請求項14記載の発明は、内ダイの径が吐出口に向って徐々に拡張するテーパ角度 θ が $30^\circ \leq \theta < 90^\circ$ であり、内ダイの最小径Aと最大径Bの比率である拡張比 B/A が1.5～12.5である短繊維入りゴム成形体の製造装置にある。

【0026】本願請求項15記載の発明は、内ダイと外ダイの流路幅が、内ダイがマンドレルに連結した根元部から吐出口まで均一である短繊維入りゴム成形体の製造装置にある。

【0027】本願請求項16記載の発明は、円筒状成形体を重力に抗する方向に押出すようにダイ部を配置した製造装置にあり、円筒状成形体が重力により変形せず、寸法変化の少ない状態で押出が可能になる。

【0028】

【発明の実施の形態】以下、図1は本発明に係る短繊維入りゴム成形体の製造装置の概略図、図2は内ダイの断面図である。本発明の短繊維入りゴム成形体の製造装置1では、押出スクリュウ3の回転により短繊維を含むゴムを混練するシリンダー2と、多孔板5を通過した短繊維混入ゴム6を次の管へ移動させる連結管4と、連結管4から送られてきた短繊維混入ゴム6をマンドレル8の回転によって次工程へ移動させる押出部7と、マンドレル8に連結した内ダイ9を吐出口11に向って径を徐々に拡張させて円錐形としてこれを外ダイ10に収容し、かつ内ダイ9をその軸心中心に回転させながら、短繊維混入ゴム6を吐出口11に向って徐々に大きくなる円周方向の引き伸ばしとせん断力を同時に付与して、短繊維を円周方向に配向させた円筒状成形体13を押出成形するダイ部15と、円筒状成形体の表面層に軸方向へ直線状の切込み部を設ける切込み手段50と、切込みを入れた円筒状成形体にさらに円周方向へ張力を与える拡張手段35と、そして円筒状成形体を上記直線状の切込み部分で切開する切断手段40とを備えている。

【0029】シリンダー2はこの中に回転可能に押出スクリュウ3を収容し、短繊維を含むゴム配合物を原料投入口17から入れて押出スクリュウ3の回転によって短繊維とゴムとを混練して短繊維混入ゴム6にする。この時にシリンダー2内の空気やゴム配合物から発生したガス等は排気口(図示せず)から排出される。シリンダー2の温度はゴム種に応じて変更するが、通常40～100℃に調節され、短繊維がゴムにミキシングしやすい温度にする。また、この場合の混練時間はゴムの加硫が進行しない程度に調節する。

【0030】連結管4は、短繊維混入ゴム6を押出部7までガイドするものである。

【0031】押出部7では、連結管4から送られてきた短繊維混入ゴム6に押出部7に収容されたマンドレル8の回転によってせん断力を与えながら、該短繊維混入ゴム6を40～100℃まで加熱して熱可塑性し、押出成形しやすい状態にする。

【0032】ダイ部15はマンドレル8に連結した内ダイ9を吐出口11に向って径を徐々に拡張させて円錐形とし、これを外ダイ10に収容し、かつ内ダイ9をその軸心X中心に回転させながら、短繊維混入ゴム6を吐出口11に向って徐々に大きな円周方向への引き伸ばしと

せん断力を付与して、短繊維を円周方向に配向させた円筒状成形体13を押出成形する。

【0033】そして、ダイ部15は水平に配置されたシリンダー2と直角に固定され、しかも吐出口11から押出される円筒状成形体13を重力に抗するように置かれ、円筒状成形体13が重力により変形せず、寸法変化の少ない状態で押出を可能にしている。

【0034】内ダイ9とマンドレル8は間隙を設けて支軸30に装着し、支軸30は一端がナット31で固定された固定板34に固定され、また他端がフレーム33に支持されている。駆動ベルト(図示せず)を取付けたプーリー32はマンドレル8に固着され、該駆動ベルトの走行によって、支軸30を軸芯として内ダイ9とマンドレル8を同時に回転させる。

【0035】また、内ダイ9と外ダイ10の流路幅Wは、内ダイ9がマンドレル8に連結した根元部14から吐出口11まで均一になり、円筒状成形体13の押出にブレーキをかけることなく軸方向Dへスムーズに流し、また内部歪みのない均一な厚みの円筒状成形体13に仕上げる。

【0036】内ダイ9の形状は、せん断力の大きさに影響を与える要因になる。本実施例では図2に示すように、根元部14から吐出口11に向って徐々に径が拡張するテーパ角度 θ が $30^\circ \leq \theta < 90^\circ$ であり、内ダイ9の最小径Aが20～170mm、最大径Bが100～250mm、そしてその比率である拡張比 B/A が1.5～12.5に設定される。この設定範囲未満であれば、内ダイ9の吐出口11付近での円周方向への引き伸ばしが小さくて、厚みの大きな円筒状成形体13の外層では短繊維が円周方向に配向しなくなる。一方、この設定範囲を越えると、円周方向への引き伸ばしが大きくなり過ぎて、押出圧力が劣る場合には、円筒状成形体13が裂けやすい。

【0037】また、内ダイ9の回転数と最大径Bによって決定される周速度もせん断力の大きさに影響を与えている。その周速度は2.5～35cm/秒であり、好ましくは5.0～20cm/秒であり、2.5cm/秒未満の場合には、内ダイ9の吐出口11付近でのせん断力が小さくて、肉厚の大きな円筒状成形体13の外層では短繊維が円周方向に配向しにくくなり、一方35cm/秒を越えると、せん断力が大きくなって、内部発熱が大きくなり、該短繊維混入ゴム6の加硫によってゴム焼けが発生する。

【0038】内ダイ9と外ダイ10間の短繊維混入ゴム6の内部発熱を抑制するために、マンドレル8とこれに連結した内ダイ9の内部に冷却水を循環させる冷却装置19を設けることができる。冷却装置19では、内ダイ9の外部から冷却水を入れポンプ20によって内ダイ9とマンドレル8内に設けた通路21を通過させて内ダイ9へ排出して循環させる。上記冷却装置19はゴムの内

部発熱を押さえることができることから、内ダイ9の周速度を高めることができ、肉厚の大きくても短繊維が円周方向に配向した円筒状成形体13を押出成形することができる。

【0039】切込み手段50は、図4に示すように押出された直後の円筒状成形体13の表面層に軸方向Dに沿って直線状の切込み部51を設ける機能を有している。即ち、回転する円盤状の切込みカッター52が円筒状成形体13の表面層を押圧して、円周方向に配向した短繊維の一部を切断し、連続した直線状の切込み部51を形成するが、上記円筒状成形体13の内部には下記に示す円錐形状の補助ガイド36が接しているため、これが切込みカッター52の支持台として機能している。円筒状成形体13への切込み部51の深さは、円筒状成形体13の厚さに対して30～90%が好ましい。30%未満では、次の工程であるシートの切開が困難になる。

【0040】押出し直後の円筒状成形体13に円周方向へ張力を与える拡張手段35の一つとして、円錐形状の補助ガイド36が支軸30に空転可能に挿入されている。補助ガイド36はポリアミド樹脂、フッ素樹脂などの円筒状成形体13との離型性に富みかつ軽量なものが好ましく、押出された直後の円筒状成形体13が径を拡張する方向へ変形する機能があれば、寸法は問わないが、軸方向Dへ向って徐々に径が拡張するものであればよい。そのテーパ角度は5～60°であり、5°未満になると、円周方向への張力が小さくて容易に切開できなくなり、また円筒状成形体13がシート化するまでの距離が長くなって、切開したシート44が自重により変形し正しく切開できなくなる不具合が起る。一方60°を越えると、円周方向へ張力が大きくなりすぎて、切開方向が不安定になり左右対称に正しく切開できなくなることがある。

【0041】また、他の拡張手段35としては、圧縮空気を排出する気体吹き付け装置37であり、押出された直後の円筒状成形体13を膨張させて円周方向へ引張る機能と円筒状成形体13を早期の冷却する機能を備えている。この気体吹き付け装置37は、円筒状成形体13の外部に配置され、圧縮空気を供給するコンプレッサー（図示せず）と、これに接続し円筒状成形体13の内部に設置されたノズル38からなり、圧縮空気39をノズル38から多方向へ排出して円筒状成形体13を膨張させ円周方向へ張力を与える。これによって、円筒状成形体13の切開作業が容易になり、また円筒状成形体13を早期に冷却して、ゴムのスコーチを防ぎ品質を安定化させる働きがある。

【0042】円筒状成形体13を軸方向Dへ切開する切断手段40は、カッター、ナイフといった刃物、あるいはレーザーナイフ、超音波振動からなり、円筒状成形体13を引裂くように切断するもので、円筒状成形体13の中央部分に位置して左右対称に切断する。無論、刃物

のような切断手段40に加熱すれば、円筒状成形体13の切開を容易にすることもできる。また、ここで使用する刃物の場合、自転できる回転体刃物が好ましく、これによって円筒状成形体13を容易に切断することができる。

【0043】ガイド部材43は例えば合成樹脂製、金属製の棒状体、筒状体であり、両端部45が切開したシート44の両端部45に当接するようにガイドロール46の手前に配置されている。切開したシート44の端部45が折れ曲がることなく完全にシート化し、ガイドロール46へ巻付けて、連続して移動させることができる。

【0044】ここで使用するゴムは、天然ゴム、ブチルゴム、スチレン-ブタジエンゴム、クロロプレンゴム、エチレン-プロピレンゴム、アルキル化クロロスルフェン化ポリエチレン、水素化ニトリルゴム、水素化ニトリルゴムと不飽和カルボン酸金属塩との混合ポリマー、エチレン-プロピレンゴム（EPR）やエチレン-プロピレン-ジエンモノマー（EPDM）からなるエチレン-α-オレフィンエラストマー等のゴム材の単独、またはこれらの混合物が使用される。ジエンモノマーの例としては、ジシクロペンタジエン、メチレンノルボルネン、エチリデンノルボルネン、1,4-ヘキサジエン、シクロオクタジエンなどがあげられる。

【0045】上記ゴムには、アラミド繊維、ポリアミド繊維、ポリエステル繊維、綿等の繊維からなり繊維の長さは繊維の種類によって異なるが1～10mm程度の短繊維が用いられ、例えばアラミド繊維であると3～5mm程度、ポリアミド繊維、ポリエステル繊維、綿であると5～10mm程度のものが用いられる。その添加量はゴム100重量部に対して10～40重量部である。

【0046】更に、本発明のゴムには、軟化剤、カーボンブラックからなる補強剤、充填剤、老化防止剤、加硫促進剤、加硫剤等が添加される。

【0047】上記軟化剤としては、一般的なゴム用の可塑剤、例えばジブチルフタレート（DBP）、ジオクチルフタレート（DOP）等のフタレート系、ジオクチルアジバート（DOA）等のアジバート系、ジオクチルセバケート（DOS）等のセバケート系、トリクレジルホスフェート等のホスフェートなど、あるいは一般的な石油系の軟化剤が含まれる。

【0048】本発明では、予めゴム少なくとも短繊維をオープンロール、混練機などによって荒練してマスターバッチを作製する。この方法では、オープンロールによってポリマー100重量部に10～40重量部の短繊維を投入して混練した後、混練したマスターバッチをいったん放出し、これを20～50℃まで冷却する。これはゴムのスコーチを防止するためである。

【0049】尚、短繊維とともに1～10重量部の軟化剤を投入することができる。これによって短繊維とゴムのなじみが良くなり、ゴム中への分散が良くなるばかり

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か、短繊維自体が絡み合っ綿状になるのを防ぐ効果がある。即ち、軟化剤が短繊維に浸透し、素繊維同士の絡み合いがほぐれるための潤滑剤としての役割をはたし、短繊維が綿状になるのを阻止し、かつ短繊維とゴムのなじみが良くなって短繊維の分散が良くなる

【0050】続いて、短繊維を含んだゴムをシリンダー2の押出スクリー3で混練りした後、マンドレル8の先端に接続したダイ部15から押出して円筒状成形体13を製造するが、上述のごとくマンドレル8に連結した内ダイ9を吐出口に向って径を徐々に拡張させて円錐形とし、これを外ダイ10に収容し、かつ内ダイ9をその軸心X中心に回転させながら、短繊維混入ゴム6を吐出口11に向って徐々に大きくなる円周方向の引き伸ばしとせん断力を付与して、短繊維22を円周方向に配向させた円筒状成形体13を押出成形する。

【0051】その後、連続して押出成形された円筒状成形体13は、短繊維22が内層から外層にかけて円周方向に配向した厚さ1~10mmのものであり、上記拡張手段35、切開手段40、ガイド部材43を組み合わせて用いることによって押出方向に連続して切開し、短繊維22が幅方向に配向した幅（内ダイ9の最大径 $B \times \pi$ ）の連続した長尺の完全なシート44を得ることができる。これを次工程の成型ドラムの周面に巻付け、その後伝動ベルトの成形に使用することができる。

【0052】

【実施例】次に、短繊維入りゴム成形体の製造方法の具体的実施例を以下に示す。

実施例1~2

表1に示すクロロプレンゴム配合物、表2に示すEPDMゴム配合物を用い、予めオープンロールによってゴムに短繊維を投入して混練した後、混練したマスターバッチをいったん放出し、これを常温まで冷却する。このマスターバッチと他の配合剤を図1に示す短繊維入りゴム成形体の製造装置のシリンダーに投入し、押出スクリー3の回転により短繊維を混入した。そして、表3に示す条件で内ダイをその軸心中心に回転させながら、短繊維混入ゴムを吐出口に向って徐々に大きくなる円周方向の引き伸ばしとせん断力を付与して、短繊維を円周方向に配向させた円筒状成形体を押出成形した。

【0053】更に、連続して押出された円筒状成形体に、回転軸に対して空転可能に装着された円錐形状の補助ガイド（テーパ角度 30° 、長さ60mm）によってさらに円周方向へ張力を与え、また気体吹き付け装置

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により気圧 6 kgf/cm^2 の圧縮空気をノズルから供給して円筒状成形体を膨張させて円周方向へ張力を与えた。そして、切開手段としてナイフを使用し、また棒状のガイド部材（直径30mm、長さ600mm）をガイドロールの手前に配置し、切開したシートの両端部に当接させた。

【0054】

【表1】

配合薬品	重量部
CR（硫黄変性タイプ）	100
ステアリン酸	2
ナイロンカット糸	15
アラミドカット糸	5
オイル	5
カーボンブラック	25
老化防止剤	4
ビスマレイミド	2
ZnO	5

【0055】

【表2】

配合薬品	重量部
EPDM	100
ナイロンカット糸	15
アラミドカット糸	5
ステアリン酸	1
酸化亜鉛	5
カーボンブラック	50
オイル	10
老化防止剤	2
N,N'-m-フェニレンジアレイミド	2
ハートサイト	8

【0056】本実施例における成形条件の押出スクリー3の温度と回転数、内ダイの周速度（変量）と温度、円筒状成形体の厚みと外径、吐出量、円筒状成形体の内外層温度、円筒状成形体の厚み、内ダイの最小径、最大径、拡張比、切込み部の深さ、補助ガイドのテーパ角度と長さ、圧縮空気の圧力、そして棒状のガイド部材の直径、長さ等を表3に示す。

【0057】

【表3】

	実施例 1	実施例 2
ゴム種	C R	E P D M
スクリー温度 (°C)	45	90
スクリー回転数 (rpm)	5.0	5.0
シリンダー後部温度 (°C)	70	85
シリンダー前部温度 (°C)	75	90
内ダイ温度 (°C)	75	90
内ダイ周速度	2.5~15	5~15
内ダイの最小径A (mm)	54	54
内ダイの最大径B (mm)	190	190
内ダイの最大径B/最小径A	3.5	3.5
内ダイの長さ (mm)	150	150
吐出量 (kg/hr)	10	22.0
円筒状成形体外層温度 (°C)	80~110	90~110
円筒状成形体内層温度 (°C)	80~125	100~120
円筒状成形体の厚み (mm)	4.0	4.0
切込み部の深さ (mm)	2.4	2.4
補助ガイドのテーパ角度 (°)	30	30
補助ガイドの長さ (mm)	60	60
圧縮空気の圧力 (kgf/cm ²)	6	6
ガイド部材の直径 (mm)	30	30
ガイド部材の長さ (mm)	600	600

【0058】かくして得られたシートは端部の重なりもなく、連続してトラブルなく切開することができた。また、シートの短繊維配向性の評価を行なった。この評価では、図5に示すようにシートを4枚にスライスして外層①から内層④の4層に区分した。これらの各シートの円周方向と軸方向のそれぞれの引張強度(TB)をJIS K6251に準じて測定し、引張強度比(TB比)(円周方向/軸方向)を求めた。円周方向の引張強度が軸方向の引張強度に比べて大きい程、即ち引張強度比が大きいほど、短繊維の円周方向への配向性が良好になっている。その結果を図6と図7に示す。

【0059】これによると、外層と内層には短繊維配向性の差がなく、また内ダイの周速度が高くなるにつれて、TB比が高くなり、短繊維がより円周方向に配向していることが判る。

【0060】

【発明の効果】以上のように本願請求項に係る発明では、外ダイに収容した円錐形の内ダイをその軸心中心に回転させることにより、短繊維を含むゴムに吐出口に向かって徐々に大きくなる円周方向への引き伸ばしとせん断力を同時に付与することができることから、短繊維を円周方向に配向させた円筒状成形体を得ることができる。しかも、内ダイの周速度を調節することによって、厚みの大きい円筒状成形体でも短繊維を円周方向に配向させることができ、また内ダイの周速度を变量することで、短繊維の円周方向への配向率を制御できるのでダイの交換が不要になる。また、押出された円筒状成形体の表面層に予め軸方向へ直線状の切込み部を入れた後、円筒状

* 成形体に円周方向へ張力を与えつつ、該切込み部で切開しながら容易にシートに仕上げる事が可能になる効果がある。

【図面の簡単な説明】

【図1】本発明に係る短繊維入りゴム成形体の製造装置の概略図である。

【図2】内ダイの断面図である。

【図3】円筒状成形体に直線状の切込み部を入れ、さらに円周方向へ張力を与えながら、上記円筒状成形体を切開してシートにする状態を示す説明図である。

【図4】図3のZ-Z方向の断面図である。

【図5】円筒状成形体をナイフで切開して得たシートを外層から内層にかけて4層にスライスした状態を示す図である。

【図6】実施例1に係り、クロロブレンゴム配合物を用いた得られたシートの各スライス層ごとのTB比(引張強度比)と内ダイの周速度との関係を示すグラフである。

【図7】実施例2に係り、EPDMゴム配合物を用いた得られたシートの各スライス層ごとのTB比(引張強度比)と内ダイの周速度との関係を示すグラフである。

【図8】従来における未加硫ゴム中に短繊維を一定方向へ配向させる圧延シート作製工程を(a)に、カットした圧延シートを数枚重ね合わせて所定厚みに積層する積層工程を(b)に、そして積層物を成形ドラムに巻き付ける巻付け工程を(c)に示す。

【符号の説明】

1 短繊維入りゴム成形体の製造装置

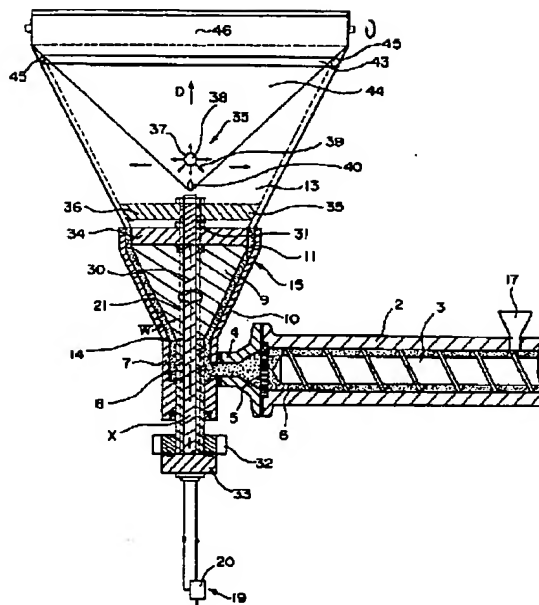
15

16

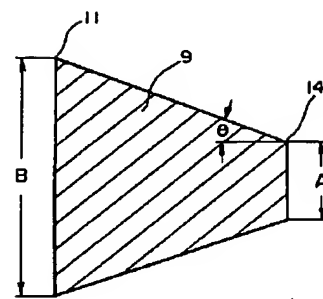
- 2 シリンダー
- 3 押出スクリュー
- 4 連結管
- 6 短繊維混入ゴム
- 7 押出部
- 8 マンドレル
- 9 内ダイ
- 10 外ダイ
- 11 吐出口
- 13 円筒状成形体

- 15 ダイ部
- 35 拡張手段
- 36 補助ガイド
- 37 気体吹き付け装置
- 40 切断手段
- 43 ガイド部材
- 44 シート
- 50 切込み手段
- 51 切込み部
- 52 切込みカッター

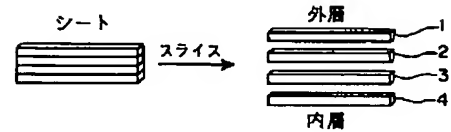
【図1】



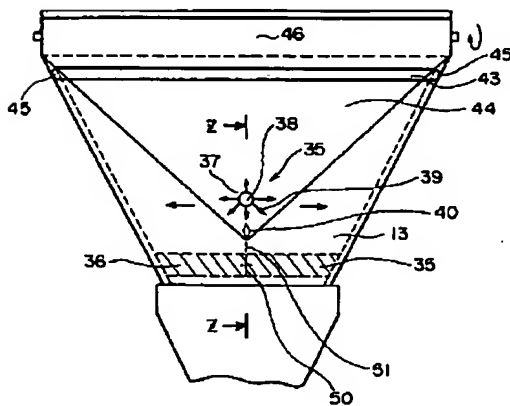
【図2】



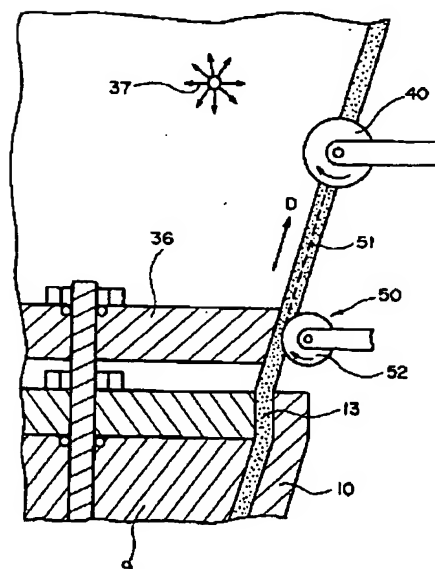
【図5】



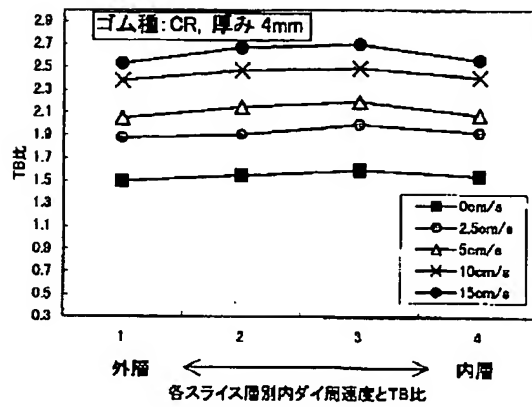
【図3】



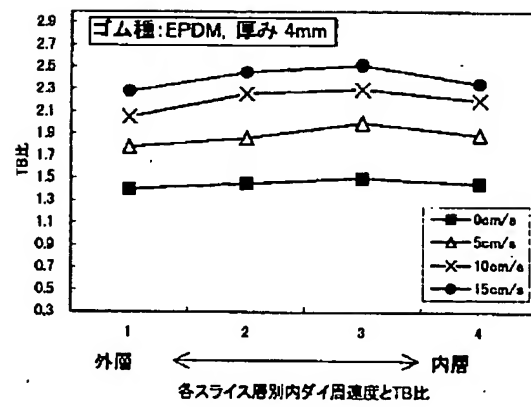
【図4】



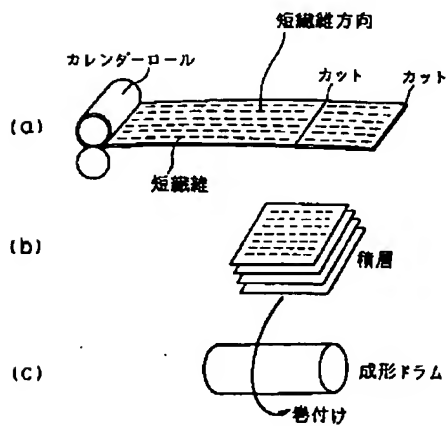
【図6】



【図7】



【図8】



NOTICES

machine translation for Japan 2002-127227

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] By this invention's relating to the manufacture approach of the rubber sheet containing a staple fiber, and its manufacturing installation, and making a path extend toward a delivery, and making into a cone form the inner die connected with the mandrel in detail, among these rotating a die By giving coincidence, the enlargement and shearing force to the circumferencial direction which becomes large gradually toward a delivery at staple fiber mixing rubber It is related with the manufacture approach of the rubber sheet containing a staple fiber to which cuts open certainly the cylindrical Plastic solid immediately after having extruded the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction, and extruding further, and a sheet is made, and its manufacturing installation.

[0002]

[Description of the Prior Art] The rolling direction of a sheet was made to carry out orientation of the staple fiber in the rubber sheet which supplied the unvulcanized rubber containing a staple fiber and was rolled out by the calendaring roll of the pair which changed rotational speed like the rolling sheet production process which shows a staple fiber as an approach of carrying out orientation in the fixed direction in an unvulcanized rubber conventionally at drawing 8 (a), and it was cut according to the belt width of face to fabricate to it. Then, the laminated material which is made to pile up each other's several rolling sheets cut like the laminating process shown in drawing 8 (b), and is continuously carried out a laminating and shown in predetermined thickness in drawing 8 (c) and in which was twisted and the staple fiber carried out orientation crosswise like a process was twisted around the shaping drum, and it was used for production of a transmission belt.

[0003] That is, by the manufacture approach of the transmission belt of V ribbed belt or a low edge V belt, this was vulcanized and it was made the belt sleeve, after having carried out spinning of the core wire which consists of a code spirally, having twisted the compression rubber layer one by one further on this, after twisting 1-two or more covering sail cloth and an adhesion rubber layer around the peripheral surface of a cylinder-like molding drum, and obtaining a layered product. The compression rubber layer used here is the thing of the thickness piled up 3-4 sheets, as shown in above-mentioned drawing 8 (b), and it had twisted around the molding drum that in which the staple fiber carried out orientation crosswise [sheet].

[0004] However, since a sheet rolling direction was not able to be made to fully carry out orientation of the staple fiber, and the rolling sheet had piled up the sheet unavoidably, it had required [if thickness was not made thin,] the great man day for obtaining the sheet for belt shaping.

[0005] As an approach of improving this, to JP,6-9847,B It is what carries out orientation of the staple fiber to the circumferencial direction of an extrusion cylinder object using the extruder furnished with an extended die. The expansion space section from which the depth changes from the predetermined depth of inlet-port space to the predetermined depth of outlet space is prepared in middle space. the cross section of the outlet space of an extended die -- the cross section of inlet-port space -- the specified quantity -- it formed greatly, and the depth of an inlet-port part was still narrower than the depth of an interstitial segment, and what the depth of an outlet part set below to the depth of an interstitial segment was proposed.

[0006] and to JP,6-106602,A The cutting equipment which cuts open the cylindrical elastomer which carried out orientation of the extruded staple fiber to the circumferencial direction to shaft orientations, Form the expansion equipment which develops the elastomer cut open to plate-like, form a guide apparatus between equipment for launching and cutting equipment further, and air is made to blow off from here. The manufacturing installation which prevented generating of the flare as could adjust the inclination of an expansion device so that turbulence of orientation might be prevented and the distance of the both ends of a sheet and a center might become equal about the staple fiber which cools suppressing the contraction to the circumferencial direction of a cylindrical elastomer, and originates in uneven contraction is indicated.

[0007]

[Problem(s) to be Solved by the Invention] However, by the approach of using the conventional extended die, since the rate of orientation was controlled by the force of the flow resulting from a die configuration, if dies were not exchanged, the rate of orientation was unchangeable, although control of the depth ratio of inlet-port space / middle space, and middle space / outlet space, the radius of an inlet-port part / outlet part, and the cross section adjusts the rate of orientation in three dimension.

[0008] Moreover, air is blown off with the guide apparatus formed between equipment for launching and cutting equipment. By the manufacturing installation which prevents turbulence of orientation, the staple fiber resulting from uneven contraction, cooling a cylindrical elastomer and suppressing the contraction to a circumferencial direction Exchange of a cutter was indispensable,

when a remarkable burden was placed on a cutter, especially a cylindrical elastomer with large thickness was cut open over long duration from the place cut to shaft orientations with a cutter, after carrying out air cooling of the extruded cylindrical elastomer. [0009] By rotating an inner die focusing on the axial center by this invention's making a path extend gradually and making a cone form the inner die connected with the mandrel toward a delivery, regardless of the thickness of a Plastic solid, as a result of inquiring wholeheartedly paying attention to this problem By giving the enlargement and shearing force to the circumferential direction which becomes large gradually toward a delivery to the rubber containing a staple fiber It aims at offering the manufacture approach of the rubber sheet containing a staple fiber which can carry out [sheet]-izing of the cylindrical Plastic solid immediately after having extruded the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferential direction, and extruding further easily, and its manufacturing installation.

[0010]

[Means for Solving the Problem] That the above-mentioned purpose should be attained invention of this application claim 1 publication In the manufacture approach of the rubber sheet containing a staple fiber to which extrudes from the die connected at the tip of a mandrel, and a sheet is made from the acquired rubber form tubed [containing a staple fiber] after kneading the rubber which mixed the staple fiber with the extrusion screw of a cylinder (1) Holding this in an outside die toward a delivery by making the inner die connected with the mandrel into the cone form to which the path was made to extend gradually, and rotating an inner die focusing on the axial center The enlargement and shearing force to a circumferential direction which become large gradually toward a delivery at the rubber containing a staple fiber are given to coincidence. Carry out extrusion molding of the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferential direction, and the straight-line-like infeed section is put into the surface layer of the cylindrical Plastic solid (2) Extruded at shaft orientations. (3) Tension is given to a circumferential direction, making a path extend further the cylindrical Plastic solid into which infeed was put, and it is in the manufacture approach of the rubber sheet containing a staple fiber used as a sheet, cutting open the (4) above-mentioned cylindrical Plastic solid in the straight-line-like infeed section.

[0011] By this manufacture approach, since the enlargement and shearing force to a circumferential direction which become large gradually toward a delivery at the rubber which contains a staple fiber by rotating the inner die of a cone form held in the outside die focusing on that axial center can be given to coincidence, the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferential direction can be acquired. And by adjusting the peripheral velocity of an inner die, since the rate of orientation to the circumferential direction of a staple fiber is controllable by being able to carry out orientation of the staple fiber to a circumferential direction also with a cylindrical Plastic solid with large thickness, and carrying out the variate of the peripheral velocity of an inner die, exchange of a die becomes unnecessary. Moreover, it becomes possible to make a sheet easily, cutting it open in this infeed section, giving tension to a cylindrical Plastic solid to a circumferential direction, after putting the straight-line-like infeed section into the surface layer of the extruded cylindrical Plastic solid to shaft orientations beforehand.

[0012] Invention of this application claim 2 publication makes a path extend the cylindrical Plastic solid immediately after extruding in the auxiliary guide of a cone configuration further, it is the manufacture approach of the rubber sheet containing a staple fiber of giving tension to a circumferential direction, and sheet-ization by incision becomes easy.

[0013] Invention of this application claim 3 publication is making the auxiliary guide of a cone configuration into susceptor, and pressing a cutter to the front face of a cylindrical Plastic solid, and is in the manufacture approach of the rubber sheet containing a staple fiber of preparing the straight-line-like infeed section in shaft orientations, the staple fiber which carried out orientation to the circumferential direction of a cylindrical Plastic solid beforehand is cut partially, and sheet-ization by subsequent incision becomes easy.

[0014] When cutting a cylindrical Plastic solid open, invention of this application claim 4 publication is the manufacture approach of giving tension to a circumferential direction, spraying a compression gas on the interior of a cylindrical Plastic solid, and if it is cut open, it can be sheet-sized easily.

[0015] Invention of this application claim 5 publication is the manufacture approach which contacts the both ends of the sheet which cut the guide member open, and it can be sheet-sized easily, without the edge of the sheet cut open lapping.

[0016] Invention of this application claim 6 publication is the manufacture approach which extruded the cylindrical Plastic solid in the direction which resists gravity, and does not deform a cylindrical Plastic solid with gravity, but extrusion becomes possible in the condition with few dimensional changes.

[0017] Invention of this application claim 7 publication is the manufacture approach rotated focusing on an axial center, cooling the interior of an inner die, even if it raises the peripheral speed of an inner die by cooling the interior of an inner die, it can prevent the scorching of the rubber by internal generation of heat, and as a result, it can carry out orientation of the staple fiber to a circumferential direction also with a cylindrical Plastic solid with large thickness.

[0018] After invention of this application claim 8 publication kneads the rubber containing a staple fiber with the extrusion screw of a cylinder, In the manufacturing installation of the rubber sheet containing a staple fiber to which extrudes from the die connected at the tip of a mandrel, and a sheet is made from the acquired rubber form tubed [containing a staple fiber] The cylinder which kneads the rubber which contains a staple fiber by rotation of an extrusion screw, While holding the extrusion section to which staple fiber mixing rubber is moved by rotation of a mandrel, and the inner die which connected with the mandrel in an outside die and making the path of an inner die extend gradually toward a delivery The die section which carries out extrusion to the cylindrical Plastic solid which an inner die is made pivotable focusing on the axial center, and the enlargement and shearing force to a circumferential direction were given [Plastic solid], and carried out orientation of the staple fiber to the circumferential direction, An infeed means to prepare the straight-line-like infeed section in the surface layer of the cylindrical

Plastic solid immediately after extruding to shaft orientations, It is in the manufacturing installation of the rubber sheet containing a staple fiber equipped with an extended means to give tension further to the cylindrical Plastic solid into which infeed was put to a circumferential direction, and a cutting means to cut a cylindrical Plastic solid open in the straight-line infeed part of the above. [0019] Since the shearing force of enlargement and a hand of cut is given [the circumferential direction which becomes large gradually toward a delivery like claim 1 publication] to staple fiber mixing rubber at coincidence, the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferential direction can be acquired. And by adjusting the peripheral velocity of an inner die, the rate of orientation to the circumferential direction of a staple fiber can be controlled by being able to carry out orientation of the staple fiber to a circumferential direction also with a cylindrical Plastic solid with large thickness, and carrying out the variate of the peripheral velocity of an inner die, and exchange of a die becomes unnecessary. Moreover, giving tension to a cylindrical Plastic solid to a circumferential direction, after putting the straight-line-like infeed section into the surface layer of the extruded cylindrical Plastic solid to shaft orientations beforehand, in order to cut it open in this infeed section, it becomes possible to make a sheet easily.

[0020] Invention of this application claim 9 publication Since an extended means is in the manufacturing installation of the rubber sheet containing a staple fiber which is made to extend a path for the cylindrical Plastic solid immediately after extruding further, and gives tension to a circumferential direction and which is the auxiliary guide of a cone configuration and tension is applied to the cylindrical Plastic solid at the circumferential direction, sheet-ization by incision becomes easy.

[0021] The manufacturing installation of the rubber sheet containing a staple fiber whose susceptor of this cutter it is a cutter and is the auxiliary guide of a cone configuration which an infeed means presses a cylindrical Plastic solid from a front face, and prepares the straight-line-like infeed section in shaft orientations has invention of this application claim 10 publication, the staple fiber which carried out orientation to the circumferential direction of a cylindrical Plastic solid beforehand is cut partially, and sheet-ization by subsequent incision becomes easy.

[0022] Since the manufacturing installation of the rubber sheet containing a staple fiber which is gas blasting equipment which gives tension to a circumferential direction has invention of this application claim 11 publication and it has required tension for the cylindrical Plastic solid like claim 9 at the circumferential direction, spraying a compression gas on the interior of the cylindrical Plastic solid immediately after extruding an extended means, sheet-ization by incision becomes easy.

[0023] Invention of this application claim 12 publication can be sheet-ized completely, without being in the manufacturing installation of the rubber sheet containing a staple fiber arranged so that the both ends of the sheet which the guide member cut open may be contacted, and the edge of the sheet cut open lapping.

[0024] The inner die which invention of this application claim 13 publication rotates focusing on an axial center is in the manufacturing installation of the rubber sheet containing a staple fiber equipped with the equipment which cools the interior, can raise the peripheral speed of an inner die by cooling an inner die, and, as a result, can carry out orientation of the staple fiber to a circumferential direction also with a cylindrical Plastic solid with large thickness.

[0025] Cone-angle θ which the path of an inner die extends gradually toward a delivery is $30 \text{ degrees} \leq \theta < 90 \text{ degrees}$, and invention of this application claim 14 publication has extended ratio B/A which is the ratio of the diameter A of min of an inner die, and an overall diameter B in the manufacturing installation of the rubber Plastic solid containing a staple fiber which are 1.5-12.5.

[0026] Invention of this application claim 15 publication has the depth of an inner die and an outside die in the manufacturing installation of the rubber Plastic solid containing a staple fiber uniform from root Motobe to a delivery which the inner die connected with the mandrel.

[0027] The manufacturing installation which has arranged the die section has invention of this application claim 16 publication so that a cylindrical Plastic solid may be extruded in the direction which resists gravity, it does not deform a cylindrical Plastic solid with gravity, but extrusion becomes possible in the condition with few dimensional changes.

[0028]

[Embodiment of the Invention] Hereafter, the schematic diagram of the manufacturing installation of the rubber Plastic solid containing a staple fiber which drawing 1 requires for this invention, and drawing 2 are the sectional views of an inner die. In the manufacturing installation 1 of the rubber Plastic solid containing a staple fiber of this invention The cylinder 2 which kneads the rubber which contains a staple fiber by rotation of the extrusion screw 3, The interconnecting tube 4 which moves the staple fiber mixing rubber 6 which passed the perforated plate 5 to the following tubing, The extrusion section 7 which moves the staple fiber mixing rubber 6 sent from the interconnecting tube 4 to degree process by rotation of a mandrel 8, Making a path extend gradually, and holding this in the outside die 10 toward a delivery 11, by making into a cone form the inner die 9 connected with the mandrel 8, and rotating the inner die 9 focusing on the axial center The enlargement and shearing force of a circumferential direction which become large gradually toward a delivery 11 about staple fiber mixing rubber 6 are given to coincidence. The die section 15 which carries out extrusion molding of cylindrical Plastic solid 13 which carried out orientation of the staple fiber to the circumferential direction, The surface layer of a cylindrical Plastic solid is equipped with a cutting means 40 to cut open an infeed means 50 to prepare the straight-line-like infeed section, an extended means 35 to give tension to a circumferential direction further at the cylindrical Plastic solid into which infeed was put, and a cylindrical Plastic solid, in the straight-line infeed part of the above, to shaft orientations.

[0029] A cylinder 2 holds the extrusion screw 3 pivotable into this, the rubber compound containing a staple fiber is put in from raw material input port 17, and by rotation of the extrusion screw 3, kneads a staple fiber and rubber and makes them staple fiber mixing rubber 6. The gas which occurred from the air and the rubber compound in a cylinder 2 at this time is discharged from an

exhaust port (not shown). Although the temperature of a cylinder 2 is changed according to a rubber kind, it is usually adjusted by 40-100-degreeC, and is made the temperature which a staple fiber tended to mix to rubber. Moreover, the mixing time in this case is adjusted to extent to which vulcanization of rubber does not advance.

[0030] An interconnecting tube 4 guides staple fiber mixing rubber 6 to the extrusion section 7.

[0031] In the extrusion section 7, it changes into the condition that heat and carry out heat plasticization of this staple fiber mixing rubber 6, and it tends to carry out extrusion molding to 40-100-degreeC, giving shearing force to the staple fiber mixing rubber 6 sent from the interconnecting tube 4 by rotation of the mandrel 8 held in the extrusion section 7.

[0032] Making a path extend gradually, making into a cone form the inner die 9 connected with the mandrel 8 toward a delivery 11, and holding this in the outside die 10, and rotating the inner die 9 focusing on the axial center X, the die section 15 gives the enlargement and shearing force to a gradually big circumferencial direction for staple fiber mixing rubber 6 toward a delivery 11, and carries out extrusion molding of cylindrical Plastic solid 13 which carried out orientation of the staple fiber to the circumferencial direction.

[0033] And it is fixed to the cylinder 2 and right angle which have been arranged horizontally, and the die section 15 does not deform cylindrical Plastic solid 13 for cylindrical Plastic solid 13 moreover extruded from a delivery 11 with gravity by being placed so that gravity may be resisted, but makes extrusion possible in the condition with few dimensional changes.

[0034] A pivot 30 is fixed to the stationary plate 34 to which the end was fixed with the nut 31 by the inner die 9 and a mandrel 8 preparing a gap, and equipping a pivot 30 with it, and the other end is supported by the frame 33. The pulley 32 furnished with a driving belt (not shown) fixes to a mandrel 8, and makes coincidence rotate the inner die 9 and a mandrel 8 by making a pivot 30 into an axis by transit of this driving belt.

[0035] Moreover, the inner die 9 becomes homogeneity from root Motobe 14 who connected with the mandrel 8 to a delivery 11, and cylindrical Plastic solid 13 of the uniform thickness which does not have a sink and internal distortion smoothly is made to the depth W of the inner die 9 and the outside die 10 to shaft orientations D, without applying brakes to the extrusion of cylindrical Plastic solid 13.

[0036] The configuration of the inner die 9 becomes the factor which affects the magnitude of shearing force. In this example, as shown in drawing 2, cone-angle theta which a path extends gradually toward a delivery 11 from root Motobe 14 is 30 degrees $\leq \theta < 90$ degrees, and extended ratio B/A whose overall diameters B the diameter A of min of the inner die 9 is 20-170mm, and are 100-250mm and a ratio of those is set as 1.5-12.5. If it is under this setting range, in the outer layer of cylindrical Plastic solid 13 with the small enlargement to the circumferencial direction of delivery 11 near [the inner die 9], and big thickness, a staple fiber will not carry out orientation to a circumferencial direction. On the other hand, when this setting range is crossed and extrusion pressure is [the enlargement to a circumferencial direction becomes large too much and] inferior, cylindrical Plastic solid 13 tends to split.

[0037] Moreover, the peripheral velocity determined with the rotational frequency and overall diameter B of the inner die 9 has also affected the magnitude of shearing force. If it is hard coming to carry out orientation of the staple fiber to a circumferencial direction in the outer layer of big cylindrical Plastic solid 13 the peripheral velocity is 2.5-35cm/second, are 5.0-20cm/second preferably, small [to the case of less than 2.5cm/second] the shearing force in the delivery of inner die 9 11 neighborhood and thick and exceeds in 35cm/second on the other hand, shearing force will become large, internal generation of heat becomes large, and rubber burning occurs with vulcanization of this staple fiber mixing rubber 6.

[0038] In order to control internal generation of heat of the staple fiber mixing rubber 6 between the inner die 9 and the outside die 10, the cooling system 19 made to circulate through cooling water can be formed in the interior of the inner die 9 connected with a mandrel 8 and this. The path 21 which put in cooling water from the exterior of the inner die 9, and was prepared in the inner die 9 and the mandrel 8 with the pump 20 is passed, and it is made to discharge and circulate to the inner die 9 in a cooling system 19. Since it can press down internal generation of heat of rubber, the above-mentioned cooling system 19 can raise the peripheral velocity of the inner die 9, and even if large, it can carry out extrusion molding of thick cylindrical Plastic solid 13 in which the staple fiber carried out orientation to the circumferencial direction.

[0039] The infeed means 50 has the function to form the straight-line-like infeed section 51 in the surface layer of cylindrical Plastic solid 13 immediately after extruding as shown in drawing 4 in accordance with shaft orientations D. That is, although the rotating disc-like infeed cutter 52 presses the surface layer of cylindrical Plastic solid 13, cuts some staple fibers which carried out orientation to the circumferencial direction and forms the infeed section 51 of the shape of a continuous straight line, since the auxiliary guide 36 of the cone configuration shown below is in contact with the interior of above-mentioned cylindrical Plastic solid 13, this is functioning as susceptor of the infeed cutter 52. 30 - 90% of the depth of the infeed section 51 to cylindrical Plastic solid 13 is desirable to the thickness of cylindrical Plastic solid 13. At less than 30%, incision of the sheet which is the following process becomes difficult.

[0040] As one of the extended means 35 which gives tension to a circumferencial direction, the auxiliary guide 36 of a cone configuration is inserted in cylindrical Plastic solid 13 immediately after extrusion possible [the slip to a pivot 30]. By the auxiliary guide 36 being rich in a mold-release characteristic with cylindrical Plastic solid 13 of polyamide resin, a fluororesin, etc., a lightweight thing is desirable, and although a dimension will not be asked if there is a function which deforms in the direction where cylindrical Plastic solid 13 immediately after extruding extends a path, a path should just be gradually extended toward shaft orientations D. The fault for which are 5-60 degrees, distance if it becomes less than 5 degrees, until it will become impossible to cut it open easily [the tension to a circumferencial direction is small and] and cylindrical Plastic solid 13 will sheet-ize becomes long, the sheet 44 cut open deforms the cone angle with a self-weight, and it becomes impossible to cut open

correctly happens. When 60 degrees is exceeded, tension becomes large too much to a circumferential direction, the incision direction becomes unstable, and it may be able to stop being able to cut it open correctly to bilateral symmetry on the other hand. [0041] Moreover, as other extended means 35, it is gas blasting equipment 37 which discharges the compressed air, and has the function which cylindrical Plastic solid 13 immediately after extruding is expanded, and is pulled to a circumferential direction, and the function in which an early stage cools cylindrical Plastic solid 13. This gas blasting equipment 37 is arranged to the exterior of cylindrical Plastic solid 13, consists of a compressor (not shown) which supplies the compressed air, and a nozzle 38 which connected with this and was installed in the interior of cylindrical Plastic solid 13, discharges the compressed air 39 in the many directions from a nozzle 38, expands cylindrical Plastic solid 13, and gives tension to a circumferential direction. There is work which incision of cylindrical Plastic solid 13 becomes [work] easy, and cylindrical Plastic solid 13 is cooled [work] at an early stage, and the scorching of rubber is prevented [work], and stabilizes quality by this.

[0042] A cutting means 40 to cut cylindrical Plastic solid 13 open to shaft orientations D consists of cutters, such as a cutter and a knife, or a laser knife, and supersonic vibration, it is cut so that cylindrical Plastic solid 13 may be torn, is located in the central part of cylindrical Plastic solid 13, and is cut to bilateral symmetry. Of course, if it heats for a cutting means 40 like a cutter, incision of cylindrical Plastic solid 13 can also be made easy. Moreover, in the case of the cutter used here, the body-of-revolution cutter which can rotate is desirable, and this can cut cylindrical Plastic solid 13 easily.

[0043] It is the product made of synthetic resin, a metal rod-like structure, and a tube-like object, and the guide member 43 is arranged before the guide roll 46 so that the both ends 45 of the sheet 44 which both ends 45 cut open may be contacted. It sheet-izes completely, without the edge 45 of the sheet 44 cut open bending, and it can twist to the guide roll 46 and can be made to move to it continuously.

[0044] The independence of rubber material, such as an ethylene-alpha olefin elastomer which the rubber used here becomes from the mixed polymer of natural rubber, isobutylene isoprene rubber, a styrene butadiene rubber, chloroprene rubber, ethylene-propylene rubber, alkylation chloro sulfane-ized polyethylene, hydrogenated nitrile rubber, hydrogenated nitrile rubber, and an unsaturated-carboxylic-acid metal salt, ethylene-propylene rubber (EPR), or an ethylene propylen dien monomer (EPDM), or such mixture are used. As an example of a diene monomer, a dicyclopentadiene, methylene norbornene, ethylidene norbornene, 1, 4-hexadiene, cyclo-octadiene, etc. are raised.

[0045] It consists of fiber, such as an aramid fiber, a polyamide fiber, polyester fiber, and cotton, although the die length of fiber changes to the above-mentioned rubber with classes of fiber, the staple fiber which is about 1-10mm is used for it, for example, an about 5-10mm thing is used for it as they are about 3-5mm, a polyamide fiber, polyester fiber, and cotton as it is an aramid fiber. The addition is 10 - 40 weight section to the rubber 100 weight section.

[0046] Furthermore, a softener, the reinforcing agent which consists of carbon black, a bulking agent, an antioxidant, a vulcanization accelerator, a vulcanizing agent, etc. are added by the rubber of this invention.

[0047] As the above-mentioned softener, the softener of common petroleum systems, such as phosphate, such as sebacate systems, such as horse mackerel peat systems, such as phthalate systems, such as the common plasticizer for rubber, for example, dibutyl phthalate, (DBP), and dioctyl phthalate (DOP), and dioctyl adipate (DOA), and dioctyl sebacate (DOS), and tricresyl phosphate, is contained.

[0048] this invention -- beforehand -- rubber -- even if few, a staple fiber is ****(ed) with an opening roll, a kneading machine, etc., and a masterbatch is produced. By this approach, after throwing in and kneading the staple fiber of 10 - 40 weight section in the polymer 100 weight section with an opening roll, the kneaded masterbatch is once emitted and this is cooled to 20-50-degreeC. This is for preventing the scorching of rubber.

[0049] In addition, the softener of 1 - 10 weight section can be thrown in with a staple fiber. There is effectiveness which prevents the concordance of a staple fiber and rubber becoming good, and about [that distribution into rubber becomes good] and the staple fiber itself becoming entangled, and becoming cotton-like by this. namely, a softener -- a staple fiber -- permeating -- base -- [0050] to which a role of lubricant for a tangle of fiber to get loose is played, and it prevents that a staple fiber becomes cotton-like, and the concordance of a staple fiber and rubber becomes good, and distribution of a staple fiber becomes good Then, although it extrudes from the die section 15 connected at the tip of a mandrel 8 and cylindrical Plastic solid 13 is manufactured after kneading the rubber containing a staple fiber with the extrusion screw 3 of a cylinder 2 Making a path extend gradually, making into a cone form the inner die 9 connected with the mandrel 8 like **** toward a delivery, and holding this in the outside die 10, and rotating the inner die 9 focusing on the axial center X The enlargement and shearing force of a circumferential direction which become large gradually toward a delivery 11 about staple fiber mixing rubber 6 are given, and extrusion molding of cylindrical Plastic solid 13 which carried out orientation of the staple fiber 22 to the circumferential direction is carried out.

[0051] Then, cylindrical Plastic solid 13 by which extrusion molding was carried out continuously It is a thing with a thickness of 1-10mm as for which the staple fiber 22 carried out orientation to the circumferential direction, having applied to the outer layer from the inner layer. By using combining the above-mentioned extended means 35, the incision means 40, and the guide member 43, the direction of extrusion can be followed, it can be cut open, and the long perfect sheet 44 with which the width of face (overall diameter Bxpi of the inner die 9) in which the staple fiber 22 carried out orientation crosswise continued can be obtained. This can be twisted around the peripheral surface of the molding drum of degree process, and it can be used for shaping of a transmission belt after that.

[0052]

[Example] Next, the concrete example of the manufacture approach of the rubber Plastic solid containing a staple fiber is shown below.

After throwing in and kneading a staple fiber to rubber with an opening roll beforehand using the chloroprene rubber compound shown in one to example 2 table 1, and the EPDM rubber compound shown in Table 2, the kneaded masterbatch is once emitted and this is cooled to ordinary temperature. It supplied to the cylinder of the manufacturing installation of the rubber Plastic solid containing a staple fiber which shows this masterbatch and other compounding agents to drawing 1, and the staple fiber was mixed by rotation of an extrusion screw. And rotating an inner die on the conditions shown in Table 3 focusing on the axial center, the enlargement and shearing force of a circumferencial direction which become large gradually toward a delivery about staple fiber mixing rubber were given, and extrusion molding of the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction was carried out.

[0053] Furthermore, tension was further given to the circumferencial direction with the auxiliary guide (the cone angle of 30 degrees, die length of 60mm) of a cone configuration with which the cylindrical Plastic solid extruded continuously was equipped possible [a slip] to the revolving shaft, and the compressed air of atmospheric-pressure 6 kgf/cm² was supplied from the nozzle with gas blasting equipment, the cylindrical Plastic solid was expanded, and tension was given to the circumferencial direction. And the knife was used as a cutting means, and the rod-like guide member (the diameter of 30mm, die length of 600mm) has been arranged before a guide roll, and the both ends of the sheet cut open were made to contact.

[0054]

[Table 1]

配合薬品	重量部
CR (硫黄変性タイプ)	100
ステアリン酸	2
ナイロンカット糸	15
アラミドカット糸	5
オイル	5
カーボンブラック	25
老化防止剤	4
ビスマレイミド	2
ZnO	5

[0055]

[Table 2]

配合薬品	重量部
EPDM	100
ナイロンカット糸	15
アラミドカット糸	5
ステアリン酸	1
酸化亜鉛	5
カーボンブラック	50
オイル	10
老化防止剤	2
N,N-m-フェニレンジ マレイミド	2
ハ'-オキサイド	8

[0056] The depth of the temperature of the extrusion screw of the process condition in this example, the peripheral velocity (variate) of a rotational frequency and an inner die, temperature, the thickness of a cylindrical Plastic solid, an outer diameter, discharge quantity, the inside-and-outside layer temperature of a cylindrical Plastic solid and the thickness of a cylindrical Plastic solid, the diameter of min of an inner die, an overall diameter, an extended ratio, and the infed section, the cone angle of an auxiliary guide and die length, the pressure of the compressed air and the diameter of a rod-like guide member, die length, etc. are shown in Table 3.

[0057]

[Table 3]

	実施例 1	実施例 2
ゴム種	C R	E P D M
スクリュウ温度 (℃)	4 5	9 0
スクリュウ回転数 (rpm)	5. 0	5. 0
シリンダー後部温度 (℃)	7 0	8 5
シリンダー前部温度 (℃)	7 5	9 0
内ダイ温度 (℃)	7 5	9 0
内ダイ周速度	2. 5～1 5	5～1 5
内ダイの最小径A (mm)	5 4	5 4
内ダイの最大径B (mm)	1 9 0	1 9 0
内ダイの最大径B/最小径A	3. 5	3. 5
内ダイの長さ (mm)	1 5 0	1 5 0
吐出量 (kg/hr)	1 0	2 2. 0
円筒状成形体外層温度 (℃)	8 0～1 1 0	9 0～1 1 0
円筒状成形体内層温度 (℃)	8 0～1 2 5	1 0 0～1 2 0
円筒状成形体の厚み (mm)	4. 0	4. 0
切込み部の深さ (mm)	2. 4	2. 4
補助ガイドのテーパ角度 (°)	3 0	3 0
補助ガイドの長さ (mm)	6 0	6 0
圧縮空気の圧力 (kgf/cm ²)	6	6
ガイド部材の直径 (mm)	3 0	3 0
ガイド部材の長さ (mm)	6 0 0	6 0 0

[0058] The sheet obtained in this way does not have the lap of an edge, either, and was able to be continuously cut open without the trouble. Moreover, the staple fiber stacking tendency of a sheet was evaluated. In this evaluation, as shown in drawing 5, the sheet was sliced to four sheets and classified into four layers of outer layer ** to inner layer **. It is JIS about each tensile strength (TB) of the circumferencial direction of each of these sheets, and shaft orientations. It measured according to K6251 and asked for the tensile strength ratio (TB ratio) (a circumferencial direction/shaft orientations). The stacking tendency to the circumferencial direction of a staple fiber is good, so that a tensile strength ratio is so large that the tensile strength of a circumferencial direction is large compared with the tensile strength of shaft orientations. The result is shown in drawing 6 and drawing 7.

[0059] TB ratio becomes high and it turns out that the staple fiber is carrying out orientation to the circumferencial direction more as according to this there is no difference of a staple fiber stacking tendency in an outer layer and a inner layer and the peripheral velocity of an inner die becomes high.

[0060]

[Effect of the Invention] In invention which relates to this application claim as mentioned above, since the enlargement and shearing force to a circumferencial direction which become large gradually toward a delivery at the rubber which contains a staple fiber by rotating the inner die of a cone form held in the outside die focusing on the axial center can be given to coincidence, the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction can be acquired. And by adjusting the peripheral velocity of an inner die, since the rate of orientation to the circumferencial direction of a staple fiber is controllable by being able to carry out orientation of the staple fiber to a circumferencial direction also with a cylindrical Plastic solid with large thickness, and carrying out the variate of the peripheral velocity of an inner die, exchange of a die becomes unnecessary. Moreover, it is effective in becoming possible to make a sheet easily, cutting it open in this infeed section, giving tension to a cylindrical Plastic solid to a circumferencial direction, after putting the straight-line-like infeed section into the surface layer of the extruded cylindrical Plastic solid to shaft orientations beforehand.

[Translation done.]

*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

- [Claim 1] In the manufacture approach of the rubber sheet containing a staple fiber to which extrudes from the die connected at the tip of a mandrel, and a sheet is made from the acquired rubber form tubed [containing a staple fiber] after kneading the rubber which mixed the staple fiber with the extrusion screw of a cylinder Holding this in an outside die toward a delivery by making the inner die connected with the mandrel into the cone form to which the path was made to extend gradually, and rotating an inner die focusing on the axial center The enlargement and shearing force to a circumferencial direction which become large gradually toward a delivery are given to the rubber containing a staple fiber. Carry out extrusion molding of the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction, and the straight-line-like infeed section is put into the surface layer of the extruded cylindrical Plastic solid at shaft orientations. The manufacture approach of the rubber sheet containing a staple fiber characterized by what tension is given to a circumferencial direction, making a path extend further the cylindrical Plastic solid into which infeed was put, and is made a sheet, cutting the above-mentioned cylindrical Plastic solid open in the straight-line-like infeed section.
- [Claim 2] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 of making a path extending the cylindrical Plastic solid immediately after extruding in the auxiliary guide of a cone configuration further, and giving tension to a circumferencial direction.
- [Claim 3] The manufacture approach of the rubber sheet containing a staple fiber according to claim 2 of preparing the straight-line-like infeed section in shaft orientations by making the auxiliary guide of a cone configuration into susceptor, and pressing a cutter to the front face of a cylindrical Plastic solid.
- [Claim 4] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 or 2 of giving tension to a circumferencial direction while spraying a compression gas on the interior of a cylindrical Plastic solid when cutting a cylindrical Plastic solid open.
- [Claim 5] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 to 4 which contacts the both ends of the sheet which cut the guide member open.
- [Claim 6] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 to 5 which extruded the cylindrical Plastic solid in the direction which resists gravity.
- [Claim 7] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 to 6 rotated focusing on an axial center while cooling the interior of an inner die.
- [Claim 8] In the manufacturing installation of the rubber sheet containing a staple fiber to which extrudes from the die connected at the tip of a mandrel, and a sheet is made from the acquired rubber form tubed [containing a staple fiber] after kneading the rubber which mixed the staple fiber with the extrusion screw of a cylinder The cylinder which kneads the rubber which contains a staple fiber by rotation of an extrusion screw, While holding the extrusion section to which staple fiber mixing rubber is moved by rotation of a mandrel, and the inner die which connected with the mandrel in an outside die and making the path of an inner die extend gradually toward a delivery The die section which carries out extrusion to the cylindrical Plastic solid which an inner die is made pivotable focusing on the axial center, and the enlargement and shearing force to a circumferencial direction were given Plastic solid], and carried out orientation of the staple fiber to the circumferencial direction, An infeed means to prepare the straight-line-like infeed section in the surface layer of the cylindrical Plastic solid immediately after extruding at shaft orientations, The manufacturing installation of the rubber sheet containing a staple fiber characterized by having an extended means to give tension further to the cylindrical Plastic solid into which infeed was put to a circumferencial direction, and a cutting means to cut a cylindrical Plastic solid open in the straight-line infeed part of the above.
- [Claim 9] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 whose extended means is the auxiliary guide of the cone configuration which is made to extend a path for the cylindrical Plastic solid immediately after extruding further, and gives tension to a circumferencial direction.
- [Claim 10] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 9 whose infeed means is the cutter which presses a cylindrical Plastic solid from a front face, and prepares the straight-line-like infeed section in shaft orientations and whose susceptor of this cutter is the auxiliary guide of a cone configuration.
- [Claim 11] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 or 9 whose extended means is gas blasting equipment which gives tension to a circumferencial direction while spraying a compression gas on the interior of the cylindrical Plastic solid immediately after extruding.

[Claim 12] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 to 11 arranged so that the both ends of the sheet which the guide member cut open may be contacted.

[Claim 13] The inner die which rotates focusing on an axial center is the manufacturing installation of the rubber sheet [equipped with the equipment which cools the interior] containing a staple fiber according to claim 8 to 12.

[Claim 14] Cone-angle θ which the path of an inner die extends gradually toward a delivery is the manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 to 13 whose extended ratio B/A which is $30 \text{ degrees} \leq \theta < 90 \text{ degrees}$, and is the ratios of the diameter A of min of an inner die and an overall diameter B is 1.5-12.5.

[Claim 15] The depth of an inner die and an outside die is the manufacturing installation of the rubber sheet [uniform from root Motobe whom the inner die connected with the mandrel to a delivery] containing a staple fiber according to claim 8 to 14.

[Claim 16] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 to 15 which has arranged the die section so that a cylindrical Plastic solid may be extruded in the direction which resists gravity.

[Translation done.]